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Toby Huff
thuff@fas.harvard.edu

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Civilizational Analysis and Paths Not Taken, Part II: The Great Divergence

Toby Huff

In Part I of this essay, I sketched an overview of several contrasting approaches to civilizational analysis. I also pointed out that Europe from the twelfth century onward underwent a revolutionary transformation that set it apart from all other civilizations. The present discussion presents the analysis that follows from that background and the insights of Max Weber's "Preface" to his *Collected Essays in the Sociology of Religion* (1920). It assumes the plural conception of civilizations pioneered by Durkheim, Mauss, and Benjamin Nelson.[1] The intent of the discussion is to show how very different civilizational development turned out in three civilizations, even with the mediating intervention of direct encounters.

The first encounter was between Byzantium (Greek/Roman) civilization and Islamic civilization during the 8th and 9th centuries; the second encounter focuses on the 12th century interaction between Islam and the West; and the third, the 17th century encounter between European missionaries and Chinese scholars, when the Europeans attempted to introduce modern science to China. Because these issues are so large and complex, I can only offer a rough sketch here of the many issues.[2]

Islamic Civilization: Encounters with Greek and Hellenic Culture

The first encounter, which has often been overlooked, concerns the transmission of cultural resources from Greek and Hellenic civilization to the newly emerging Islamic civilization of the ninth and tenth centuries. The focus here is not on military clashes and conquests but upon what I shall call the *axial institutions* (Benjamin Nelson's phrase) of the two civilizations. The Islamic crusades or military conquests, fought over territory (although fateful for the peoples displaced), have little to do with the shaping of the fundamental religious and legal *institutions* that were to pervade Islamic civilization from that time to modern times.

When Islamic civilization was ascending, the main representative of what has come to be known as *Western or European civilization* was represented by Byzantium, inheritor of both the Roman Empire and Greek philosophy. It was an impressive cultural formation that often awed visitors (in places like Constantinople). For present purposes, I shall only

[1] See Huff, "Civilizational Analysis and Some Paths Not Taken, Part I." *Comparative Civilizations Review* 75 (2016): 9ff.

[2] More details appear in the revised 3rd edition of my book, *The Rise of Early Modern Science: Islam, China, and the West* (Cambridge University Press, forthcoming 2017); and idem., *Intellectual Curiosity and the Scientific Revolution: A Global Perspective* (Cambridge: Cambridge University Press, 2011).

highlight the fact that Byzantium's three central components were the legacy of Greek philosophy, the unsurpassed Roman Civil Law, and the Christian faith.[3]

While focusing on the transfer of philosophical and *scientific* knowledge to Islamic civilization, it should be borne in mind that the Emperor Justinian in the sixth century reformed the whole Roman legacy of law in creating what is known as the *Corpus Juris Civilis* or the *Roman Civil Law*. This was the most developed legal system in the history of the world (as extravagant as that claim may sound.)[4] Justinian made this new legal code the law of the Byzantine empire in 534 A.D. However, because the Western portion of the Roman Empire collapsed in the middle of the 6th century, the Roman legal texts (nearly 4,500 pages in English) were lost for centuries in Western Europe and were not rediscovered until the eleventh century; that rediscovery reinvigorated European legal thought as I discussed earlier.

For us, however, I need to emphasize that the Roman Civil Law was taught in the law schools across the Middle East in the *sixth and seventh* centuries, and above all, in the leading Roman law school in Beirut on the very eve of the rise of Islam. This is significant because Muslims never paid the slightest attention to Roman Civil Law when Islamic law was being shaped and refined. This was so because Muslims considered everything before Muhammad's message the state of jahiliya**,** or ignorance and moral confusion. Consequently, Islamic law developed its own roots and its own path of jurisprudence. Only in the eighteenth and nineteenth centuries did Islamic rulers and legal scholars realize that there were serious omissions in Islamic law from the point of view of economic development and political administration (among many others). Only very selectively and gradually did they replace Islamic law in government, economic transactions and some other areas. The end result was that Islamic law was restricted to the realm of the family and marriage. But that is to get ahead of our narrative. In the case of philosophy and natural science, however, the borrowing was massive.

[3] Among others see Judith Herren, *Byzantium* (Princeton: Princeton University Press, 2007*)*; *The Oxford Dictionary of Byzantium*, edited by Alexander P. Kazhdan, (Oxford: Oxford University Press, 1991). 3 vols.

[4] The difficulty here is that scholars who know Chinese or Islamic law have relatively limited exposure to the history of Western law, especially the work of Western legal historians of the last several decades. But what is clear is that neither Chinese law nor Islamic law had anything like the sophistication of Roman law, which continued to evolve, above all, with the thorough reform of Roman law under Emperor Justinian and its fusion with Canon law. Among others see Aldo Schiavone, *The Invention of Law in the West* (Cambridge: Harvard University Press, 2012); James Brundage, *The Medieval Origins of the Legal Professions. Canonists, Civilians, and Courts* (Chicago: University of Chicago Press, 2008); idem, "The Teaching and Study of Canon Law in the Law Schools," pp. 98-120 in the *History of Medieval Canon Law in the Classical Period, 1140-1234*, edited by Wilfried and Hartmann and Kenneth Pennington (Washington: Catholic University Press of America, 2008); and Judith Herren, "Roman Law",in Herren, *Byzantium. The Surprising Life of a Medieval Empire* (Princeton University Press, 2007). Also more details in *The Rise of Early Modern Science*. 3rd edition, forthcoming. This revised view of Western legal history was launched by Harold J. Berman in *Law and Revolution* (Cambridge: Harvard University Press, 1983).

What writers on the history of Arabic-Islamic science often forget or omit is the extraordinary legacy of Greek natural science and philosophy that was translated and without which it can be argued there would not have been a golden age of scientific inquiry in the Muslim world. As can be seen in Figure 1, the Greek Scientific and Philosophical Heritage translated into Arabic was comprehensive. The cultural elite of the emerging Islamic civilization, mainly Christians and Jews, translated an extraordinary collection of scientific and philosophical texts into Arabic.

- Pythagorus (c. 580-500 BCE) — Writings on mathematics
- Hippocrates (c. 460-333 BCE) — Medical writings
- Plato (428-347 BCE) — Only epitomes and incomplete translations of all the Dialogues, especially the *Timaeus*
- Aristotle (384-322 BCE) — "Organon" – works on *Metaphysics, Physics, Meteorology, Plants and Animals, On the Heavens, Generation and Corruption, Logic (Analytics, etc), On the Soul,* etc.
- Archimedes (c. 287-212 BCE) — Works on mathematics, mechanics and hydraulics
- Apollonius of Perga (c. 262-190 BCE) — Conics
- Aristarchus of Samos (fl. 270 BCE) — Sun-centered theory
- Euclid (fl 300 BCE) — *Elements of Geometry & Optics*
- Herophilus (335-280 BCE) — Medical works
- Erasistratus (fl. c. 250 BCE) —Medical works
- Galen of Pergamon (129 CE – c. 199) — *Sixteen books on medicine and anatomy*
- Ptolemy (2nd century CE) — *Almagest* ("the greatest" book), *Tetrabiblos,*[5] *Optics*

Figure 1. Outstanding Scientific Works Translated into Arabic[6]

As time progressed, notable Islamic scholars became translators and masters of these new materials. This was especially true of scholars like al-Kindi (d. 850?) and his circle in Baghdad who did seminal philosophical and scientific work. In any case, it is fair to say that with this new intellectual cargo, the Islamic world had the most advanced science platform in the world, surpassing both Europe and China in foundational ideas that were only to reach their zenith when transferred back to Europe.

We can reduce this list down to four main areas: medicine, especially anatomy; mathematics; physical science; astronomy, and optics. However, the works of Aristotle's natural philosophy are very broad and include what we think of as natural science, even

[5] This is foundational work on astrology used in the Middle East and Europe and still regarded by many as essential for horoscopes and astrological forecasting.

[6] This list was compiled from several sources, especially F.E. Peters, *Aristotle and the Arabs* (New York: New York University Press 1968); Peters, *Allah's Commonwealth* (New York: New York University Press, 1973), and Dimitri Gutas, *Greek Thought, Arabic Culture (*London: Routledge, 1998) and other sources.

proto-physics, but also the logical instruments of reasoned discourse. Built into Aristotle's philosophy was the idea of natural causation: that natural forces operate autonomously. The task of natural science was to analyze these forces and explain how they operate. So it is not surprising that Aristotle's natural philosophy was not taught in the Islamic madrasas because it violated the fundamental Islamic principle that God is the author of every event.

Second, we should note that Plato's little book, the *Timaeus*, was not translated. Yet this book contains the heart of Greek natural philosophy, with its proclamations that the cosmos is like a great machine, guided by natural forces, and that the whole system is rationally coherent and understandable by the human intellect.

Furthermore in Plato's view, the pursuit of philosophy was the greatest boon that had ever come (or ever would come) to mankind, precisely because it enabled human beings to understand the natural universe. So here again, it is not surprising that this work was not fully translated into Arabic because it would run up against Islamic occasionalism, the worldview according to which God is always in control of everything and making predictions about how the world would work in the future is the domain of thought reserved to God.

Conversely, this rationalist account of the universe, and its notion that the human intellect is part of that rational cosmos, was taken up by medieval Christians and shaped all aspects of Western thought thereafter.[7]

Let us also note three additional elements in this translated material that would be necessary to get to the European scientific revolution and Newtonian synthesis. The first of these was the whole rationalist view constructed by both Plato and Aristotle. But in addition, there were Aristotle's *Physics* (and related books), the geometry of Euclid, and Ptolemy's great astronomical work called by the Arab translators, the *Almagest* or "the greatest book." This was the unsurpassed model for astronomical thinking that prevailed for nearly 1,000 years. By the sixteenth and seventeenth centuries, all of these elements would come together to give us the Copernican and Newtonian revolutions.

So now the question is, given this impressive cargo of Greek-inspired scientific and philosophical thought, how was it received and how was it integrated into Islamic education?

The Madrasas

The central educational institution in Islamic civilization was the *madrasa*, the place of study dedicated to the teaching of the religious sciences, the so-called "transmitted sciences" centered on Islamic law, its roots and methodologies as shown in Figure 2. This

[7] T. Huff, "Science and Metaphysics in the Three Religions of the Book," *Intellectual Discourse* (A Journal of the Kulliyah (Faculty) of Islamic Revealed Knowledge and Human Science), *International Islamic University Malaysia* 8 #2 (2000): 173-198.

educational plan meant the study of Islamic law and its auxiliary disciplines: Quranic exegesis, hadith studies [comprised of the collected sayings of the prophet Muhammad], Arab genealogy and arithmetic for the division of inheritances. Later the study of logic and *kalam* (Islamic theology) were added but the central discipline was always Islamic law. The study of Greek natural philosophy or medicine were never brought into the madrasas, as the view was maintained that nothing inimical to Islamic piety should be permitted in the madrassas. In the eleventh and twelfth century the great religious philosopher al-Ghazali (d. 1111) spoke out powerfully and harshly about the likely impious influence of the Greek rational sciences, even suggesting that those who took them up could be accused of heresy.[8]

Designed to teach the "Transmitted sciences":
Islamic Jurisprudence (fiqh) and the shari'a composed of
    Quranic studies
    Hadith studies
Arab genealogy
Arithmetic for dividing inheritances
Kalam (theology, added later) and some logic
No teaching of the natural science or medicine
Figure 2. Madrasas: Pious Endowments (*waqf*)[9]

Because these madrasas were pious endowments (*waqf*), they were simply a collection of self-appointed religious scholars, not a real faculty. There were no degrees, they could not grant a formal diploma, and there was no intellectual autonomy: most madrasas were devoted to a single school of law (of which there were four main schools). When the student had mastered the material of his teacher, shown by oral recitation, the teacher would then grant the student an *ijaza*, a "permission to transmit" that particular work, not a certification of general learning, or anything like a "license to teach." Consequently, there was no attempt, even in those rare situations where all four schools of law were represented, to create a broadly unified set of legal opinions or standard procedurals for jurisprudence. At the same time, the natural sciences were left aside.

Given this background, the paradox has always been, how was it possible to make such advances as the Arabs and Muslims did make in science when the natural sciences were never brought into the madrasas? A small part of the answer to this question is the fact that the "foreign sciences" (as Greek natural philosophy was labelled) were taught privately by some scholars in their homes. This was a far cry from the institutionalization of scientific inquiry as was carried out by the European universities from the twelfth century onward. Yet, given the high levels of scientific inquiry that had been achieved by the Greek models

[8] Al-Ghazali, *The Incoherence of the philosophers: a parallel English*-Arabic text, translated, introduced, and annotated by Michael E. Marmura. Provo,Utah: Brigham Young University Press, 2000.
[9] Among others see George Makdis*i*, *The Rise of the Colleges: Institutions of Learning in Islam and the West* (Edinburgh: Edinburgh Press, 1981)*;* Jonathan Berkey, *The Transmission of Knowledge in Medieva*l Cairo (Princeton: Princeton University Press, 1992); Michael Chamberlain, *Knowledge and Social Practice in Medieval Damascus* 1190-1350 (New York: Cambridge University Press, 1994).

imported through the translation movement, during the two hundred years of assimilation, Arabic and Islamic masters of these disciplines, commentary and improvement, did advance serious inquiry in some areas, for example, mathematics, optics, and the study of human anatomy.

Legal Impediments

For now I shall leave that question because we must look a little deeper into Islamic legal development. As I pointed out, Islamic law, the shari'a, was always and exclusively tied to its unique roots, that is, the Quran and the *Hadith* collections (the sayings of the prophet Muhammad). This inhibited innovation insofar as improving on or changing the nature of due process in shari'a laws.

Thus, to initiate a legal case, the believer would informally approach a *qadi*, a judge, perhaps walk with him outside the *qadi's* office or in his garden, explaining his complaint. The *qadi* would then translate the complaint into legal language for a trial.[10]

But notice that there were no lawyers or advocates (for which there was no Arabic word[11]) to represent either plaintiff or defendant, nor were there clearly specified "rights" whose violations would be a basis for one's case. Rather it was the various possible interpretations of holy writ that allowed a trial to begin.

At the same time, note that there were various legal helpers, clerks, professional witnesses and the agent known as the *wakil*; but he was simply any semi-literate person who could represent someone else in legal proceedings, not one who had legal training, and his limited knowledge of the facts of a case could be substituted for the defendant's or the plaintiff's first-hand account. In short, none of these actors had anything like the university training of clerks, notaries, and advocates in Europe.[12] Consequently, the *qadi* presided over the trial, asking questions as he might, and with little power to control the plaintiff or witnesses. For example, the plaintiff could at any moment appeal his case to a religious scholar, asking for a written opinion that could then be presented to the judge, who, though not bound by such advice, would have to consider whether to accept the opinion or not.[13]

Second**,** we hear a lot about *fatwas*, legal opinions issued by legal scholars (muftis) representing any of the four schools of law, but these opinions were not binding on anyone. The only binding legal rulings were issued by the judge, the *qadi*, yet these were never

[10] David Powers, *Law, Society and Culture in the Maghrib, 1300-1500* (New York: Cambridge University Press, 2002); and *Muftis and Their Opinions,* edited by Muhammad Khalid Masud, Brinkley Messick, and David S. Powers (Cambridge: Harvard University Press, 1996).

[11] Ronald Jennings, "The Office of Vekil (Wakil) in the 17th Century Ottoman Courts," *Studia Islamica* 42 (1975): 147- 169; and Emile Tyan, *Histoire d'Organisation judiciare en Pays d'Islam* (Leiden: Brill, 1960, 2nd edition).

[12] These officials in Europe were sworn members of a legal profession, or the bar. See Brundage, *Medieval Origins.*

[13] See Powers, ibid.

published, stored, or collected where they could be systematically studied. This absence of such public records available to scholars until the last quarter of the twentieth century led most scholars to conclude that there were no collections of such legal rulings. Only a very few such cases have been found because they were kept by the *qadi* in his private home, and they too disappeared with the judge's retirement. The collections of legal opinions that we do have come almost entirely from the legal *opinions* of religious scholars (*muftis*) that are not binding juridical rulings issued by judges.[14] Even when the voluminous records of religious scholars provide details of particular cases (because a religious scholar was consulted), the actual judicial decision was frequently omitted because it was not formally published as was the case in Europe.

Only in the mid-sixteenth century under the Ottomans were courthouses made available for such proceedings and for the recording of legal rulings, not solely the opinions of religious scholars.[15] Consequently, this way of proceeding (quite intentionally) never resulted in the creation of a set of *legal precedents* that should be followed by other judges.

Third, because of this legal informality and the persistence of customary practice based on Quranic models, there were no innovative legal manuals that systematized and reformed actual legal procedure as happened in European law in the twelfth and thirteenth centuries. For example, the great philosopher and legal scholar Ibn Rushd (Averröes, d. 1198) wrote a massive legal treatise, reviewing the legal opinions of the scholars associated with each of the four main schools of Islamic law (i.e. Shafi'i, Maliki, Hanbali, Hanafi). But he introduced no new legal procedures. His section on legal procedure (what we would call the domain of due process of law) is a mere two and half pages, the whole section on procedure only twenty pages. He only repeats what legal scholars said in the past that conform to understandings of what the prophet Muhammad did in his lifetime.[16]

The Problem of Scientific Development and the Middle East

While we can say that scholars in Islamic civilization made contributions to the advancement of medicine, optics, astronomy and mathematics, the fact is that after 200 years, when the Islamic Middle East was assimilating the Greek heritage, and after the *madrasas* became widely ensconced across the Muslim world, innovative scientific activity ceased.

[14] See David Powers, *Law, Society and Culture in the Maghrib, 1300-1500* (New York: Cambridge University Press, 2002); and *Muftis and Their Opinions*, edited by Muhammad Khalid Masud, Brinkley Messick, and David S. Powers (Cambridge: Harvard University Press, 1996).
[15] Wael Hallaq, "The 'qadi's diwan (*sijill*)' before the Ottomans," *Bulletin of the School of Oriental and African Studies* 61 (1998): 415- 436.
[16] Ibn Rushd, *The Distinguished Jurist's Primer*, Translated into English from the French edition of L. W. C. van Den Berg by E. C. Howard. Lahore: Law Publishing Co, 1997; v 2: 553-72.

Defenders of Arabic-Islamic science often claim that certain advances in astronomy, medicine, and mathematics laid the foundations for the rise of modern science. That, however, is a problematic claim, though not without some truth.[17]

Let us consider first the case of astronomy: no scientific revolution occurred in Muslim astronomy and no one has shown a direct connection between any Arab-Islamic astronomical innovations and the actual revolutionary departure of Copernicus, not to mention any connection with Galileo, Kepler or Newton. While it is true that Muslim mathematicians did invent algebra and did perfect trigonometry, these advances were not used by Copernicus (Galileo, Kepler or Newton) to make their revolutionary advances. Those advances were brought about by the use of geometry.[18]

The second area of important work is medicine: it was Ibn Sina, the eleventh century physician, who systematized a great deal of medical thought of the Greek physician, Galen, especially Galen's anatomical writings. These were translated into Latin and taught in the European universities for several hundred years.[19] But advances beyond that landmark were entirely the work of Europeans who began dissecting (first pigs) then human bodies in the twelfth century, whereas Muslims (and Jews) always rejected such practice as something forbidden.

In a word, the one avenue open to scientific advance of knowledge of the human body, post-mortem dissections, was forbidden in the Islamic world. The positive effect of the more permissive attitude toward anatomical inquiry in Europe after the twelfth century can be shown graphically with the following illustrations. The ancient view of the human body going back to Alexandrian physicians, postulated five systems of anatomy, and hence the "five figures." These included the muscular, nervous, and skeletal structures, plus veins and arteries as shown in figures 3-7. Alexandrian depictions of these were later picked up by Arab and Muslim physicians

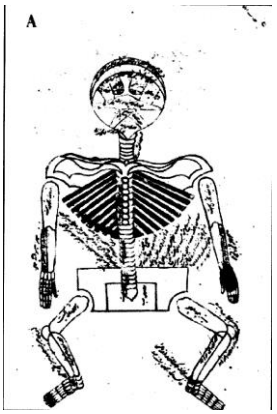

Figure 3. The Mansurian Skeleton (ca 1390), still reproduced in the nineteenth Century.

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[17] George Saliba, *Islamic Science and the Making of the European Renaissance* (Cambridge: MIT Press, 2007); Jim Khalili, *The House of Wisdom: How the Arabs Saved Ancient Science and Gave Us the Renaissance* (London; Penguin Press, 2011).

[18] For more on this see Huff, *Intellectual Curiosity*, Chapter 10.

[19] Among others see Nancy G. Siraisi, *Medieval & Early Modern Renaissance Medicine. An Introduction to Knowledge and Practice*. (Chicago: University of Chicago Press,1990).

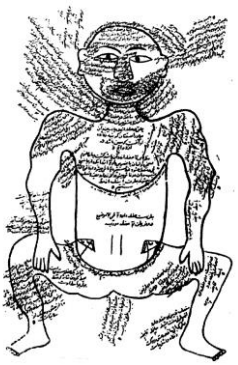

Figure 4. Mansurian muscle structure.

With minor modifications and Arabic labels added, these primitive sketches continued to be reproduced in the Muslim world all the way into the nineteenth century. The most famous rendering of these illustrations is known as the Mansurian manuscripts that were still being used in the Middle East in modern times.[20] As we see, there was a great leap forward in anatomical understanding made by Andreas Vesalius when he published his illustrated landmark, *The Fabric of the Human Body* (1543). Only several centuries later did Middle Eastern physicians, especially Turkish scholars, adopt these classic renditions of human anatomy.[21]

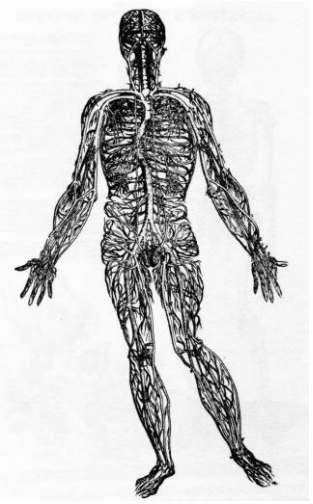

Figure 5. Versalius's Venous Man, 1543.

[20] *Tashrīḥ-i badan-i insān* (MS P 18) (*The Anatomy of the Human Body*) by Manṣūr ibn Muḥammad ibn Aḥmad ibn Yūsuf Ibn Ilyās (fl. ca. 1390). https://www.nlm.nih.gov/hmd/arabic/p18.html.

[21] See Gül Russell, "The Owl and the Pussycat: The Process of Cultural Transmission in Anatomical Illustrations." *In Transfer of Modern Science and Technology to the Muslim World*, edited by Ekmeleddin Ihsanoglu, (Istanbul: Research Center for Islamic History, Art, and Culture, 1992), pp.180-212.

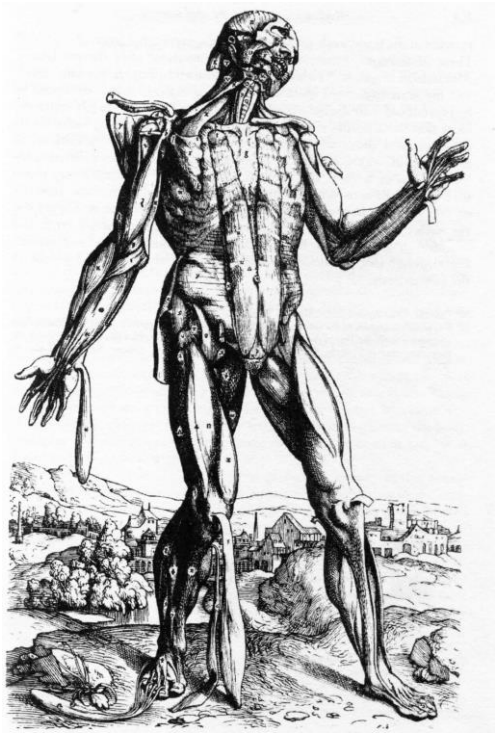

Figure 6. Vesalius's Muscle Man, 1543.

But the most important area of research advances made by Middle Easterner scholars was in optics. This was made possible by the extraordinary ability of Ibn al-Haytham, another eleventh century scholar (d. 1042), who built on the Greek heritage as well as al-Kindi's work in optics. He demonstrated the straight-line transmission of light and thereby solved a major optical problem accepted by all subsequent leaders in optical research and thus setting a positive course for future optical study. He laid important foundations for optical advance that greatly influenced eleventh century Europeans who were already poised to supersede Middle Easterners in optics.

For example, Theodoric of Freiberg around 1310 showed that the rainbow is formed by rays of light refracting and reflecting in drops of water. He came up with this explanation virtually simultaneously with two Middle Eastern scholars, Qutb al-din al-Shirazi (d. 1311), and Kamal al-Din al Farisi (d. ca.1320). Yet in a very short period of time, the Europeans surpassed the Arab-Muslim world in optical studies and technology.

Indeed, it was a European monk in Pisa who invented eyeglasses in 1286, just as Roger Bacon was demonstrating how a curved piece of glass could be used to magnify visual images and serve as corrective lenses. Soon thereafter thousands of pairs of eyeglasses were manufactured by Italians and shipped around the world, especially to the Middle East,

India, and to China.[22] Fifteenth and sixteenth century European and Mughal art has many examples of clerics and scholars wearing the newly invented spectacles, as in Figure 7.

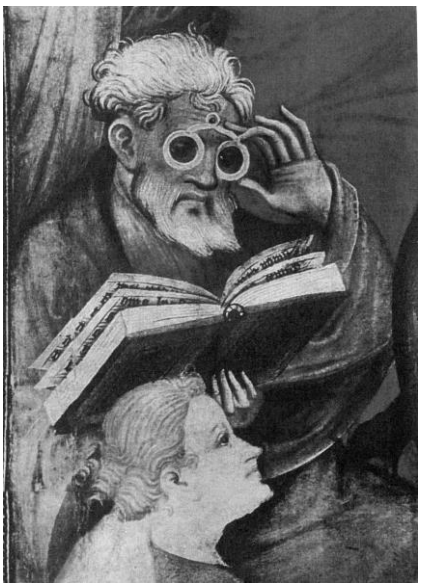

Figure 7. A German cleric wearing rivet spectacles in a painting by Konrad von Soest from the altar piece in the Stadskirche of Bad Wildungen, Germany, 1403. They had been invented by an Italian monk ca. 1296.

In the meantime, optical inquiries and similar scientific advances waned in the Muslim world. As I pointed out in *Intellectual Curiosity*, when the telescope arrived in the Muslim world, Muslims in the Middle East and Mughal India in the 1620s had little use for it and did not use it to make new advances in astronomy.

A Second Encounter: Arabic Materials Translated into Latin

We should remember that during the rise of Islamic civilization, Europe (especially Western Europe) was largely cut off from its earlier Greek inheritance. It was only when Europeans in the eleventh and twelfth centuries began to discover the cultural and intellectual resources of the Islamic Middle East that the recovery of such materials began. This era of new encounters has often been discussed in connection with the "Renaissance of the twelfth century" and the new "translation movement."[23] Europeans rediscovered the major works of Aristotle, Plato, Euclid, Galen, and others, along with the pioneering work of outstanding Arab-Muslim scholars and their commentaries on Greek works in natural philosophy.

[22] Vincent Ilardi, *Renaissance Vision from Spectacles to Telescopes*. (Philadelphia: American Philosophical Society, 2007).

[23] Charles Burnett, "Translation and Transmission of Greek and Islamic Science to Latin Christendom," in *The Cambridge History of Science: Medieval Science*, v. 2, edited by David C. Lindberg and Michael H. Shank (New York: Cambridge University Press, 2013), pp. 341-364.

This intercultural transmission project entailed a complex process whereby some Arab scholars found their way to Europe through Italy, bringing important materials with them, especially in medicine. Likewise, when European scholars visited Spanish libraries, they found many resources illustrating the apparent "rationalism" of "our Arab masters," as Adelard of Bath put it. This translation project was in many ways similar to the earlier translation of Greek thought into Arabic, except this time the Europeans were eager to assimilate the full range of this new intellectual heritage, especially Aristotle's "natural books." They not only translated all this material into their respective languages, but put major Aristotelian works in the curriculum at the center of university education all across Europe. Conversely, Muslim scholars found Aristotle's naturalistic agenda too subversive to religious orthodoxy and hence prohibited its incorporation in the madrasas.

When the Europeans incorporated the new Greek materials in the newly established universities, they created a whole new scientific agenda within institutions of higher education for the first since Plato's academy. That agenda continued all the way to the present, for these new books included Aristotle's works on *Physics, On the Heavens, On Generation and Corruption, Meteorology, The Small Works on Natural Things* as well as biological works such as *The History of Animals, The Parts of Animals, The Generation of Animals*, and so on.[24] All of this served to inculcate the new rationalist ethos of science that became the intellectual foundation on which the modern scientific revolution was launched. Not to be forgotten is the fact that although the university faculties were composed of Christian scholars, these new institutions were legally autonomous entities, a status entirely absent in Islamic law and civilization.

The Third Encounter: China and the West

In order to understand our third encounter, that between the West and China in the seventeenth century, we must shift our metaphysical outlook. As we recall, when the Reformation broke out across Europe in the early sixteenth century, Catholic officials began to look outside Europe for more believers to convert. Subsequently, the story of the Jesuit missionaries is one the most striking tales of intercultural exchange in the annals of world history. For these intrepid believers sailed around the world, often at great cost to their own lives (taking six months or more to get to China), in order to spread their religious message. That message, of course, was deeply embedded in Western philosophical and legal thought, as well as Christianity, and that outlook was radically different from the Chinese worldview.

In the Chinese metaphysical world, there was no monotheism, no push-pull causality, and no laws of nature governing the natural world and the human world. Insofar as the human world was concerned, it was the edicts of the emperor and the onerous rules of the past that were meant to control human behavior through the threat of severe punishment.

[24] Grant, *The Foundations of Modern Science in the Middle Age*s (New York: Cambridge University Press, 1996), chapters 3 and 4.

Moreover, neo-Confucian education of the time centered on texts that were seen as the original source of wisdom, propriety, and moral probity drawn from past great sages. These values were taken to be essential to inform personal identity as well as the maintenance of the Chinese state. In an effort to make the wisdom and spirit of these documents more accessible, the twelfth century Chinese moral philosopher Chu Hsi edited those texts into a new collection called *The Four Books*, which were *The Greater Learning, the Analects, the Book of Mencius,* and *the Doctrine of the Mean*,[25] but none had any scientific content. These were books about moral history, poetry, and the lessons one should learn from visiting the ideas of the great sages of the past.

However, due to the influence of Chu Hsi and his followers, these neo-Confucian texts became the canonical sources for the Civil Service Examinations that were administered on a three-year cycle, all the way to the twentieth century. Also notable was that there were no law schools nor was jurisprudence any part of the examinations.

In the realm of natural philosophy, the neo-Confucian worldview was suffused with the notion of ineffable energy (*chi'i),* manifested in *yang* and *yin,* polar elemental forces or states of nature. This organic conception of the universe of constantly recurring cycles contained the *wu hsing,* the five elements, or five phases of nature, each followed by the other: wood, water, fire, earth, and metal. With no causal forces governing these realms, it was difficult to get to a worldview of lawful regularity that might be described with mathematical precision.

So when missionaries arrived in China in the last third of the sixteenth century, especially the leader of the Jesuits, Matteo Ricci, with his university education and high proficiency in mathematics, they soon realized that Chinese science was not as advanced as Greek natural philosophy. This was especially true of Chinese astronomy, a poor substitute for the Ptolemaic system that had withstood hundreds of years of critical probing by Arab and Muslim as well as more recent European scholars.

Furthermore, Ptolemaic astronomy was based on a notion of nested spheres in the heavens and the utilization of the tools of geometry to analyze it. But both of these mathematical tools were missing in China. Recognizing this deficit, Ricci and his most important Chinese convert to Christianity, Xu Guangqi (also known as Dr. Paul), agreed that the first order of business had to be the translation of Euclid's *Elements of Geometry*, followed by the European textbook, *On the Sphere*, written by Sacrobosco (in the thirteenth century) for university students as an explanation of astronomy and the heavenly system. It had been many times revised. Furthermore, Ricci and Dr. Paul believed that the native Chinese interest in mathematics would find this new system of mathematical reasoning (and its

[25] Daniel K. Gardner, *The Four Books. The Basic Teachings of the Later Confucian Tradition* (New York: Hackett Publishing, 2007); and *Chu Hsi. Learning to be a Sage. Selections from the Conversations of Master Chu, Arranged Topically*, and Translated by Daniel K. Gardner (Berkeley: University of California Press, 1990).

unique methods for developing logic proofs) a fascinating addition to traditional Chinese mathematics.

China and Western Science

Second, the missionaries hoped Chinese scholars would see the new system as a product of a Christian civilization, thus further inducing them to convert to Christianity. (That part of the plan was only modestly successful.)[26]

This led to the great enterprise of translating the best of Western science, philosophy, technology, and mechanics into Chinese. In the end, the Jesuits brought at least 7,000 books to China and, with the aid of many Chinese scholars (some of them converts), translated these works into Chinese by the middle of the seventeenth century.

But in addition to the European books, the missionary scientists wrote dozens of new works, designed specially to explain all aspects of European astronomy. Here are some examples of the translated materials in astronomy that were brought to China when Galileo was making his revolutionary observations using the telescope. These were published by Galileo in a little book called *The Starry Messenger* in 1610; by 1615, the missionaries had translated and printed important parts of Galileo's discoveries in Chinese.

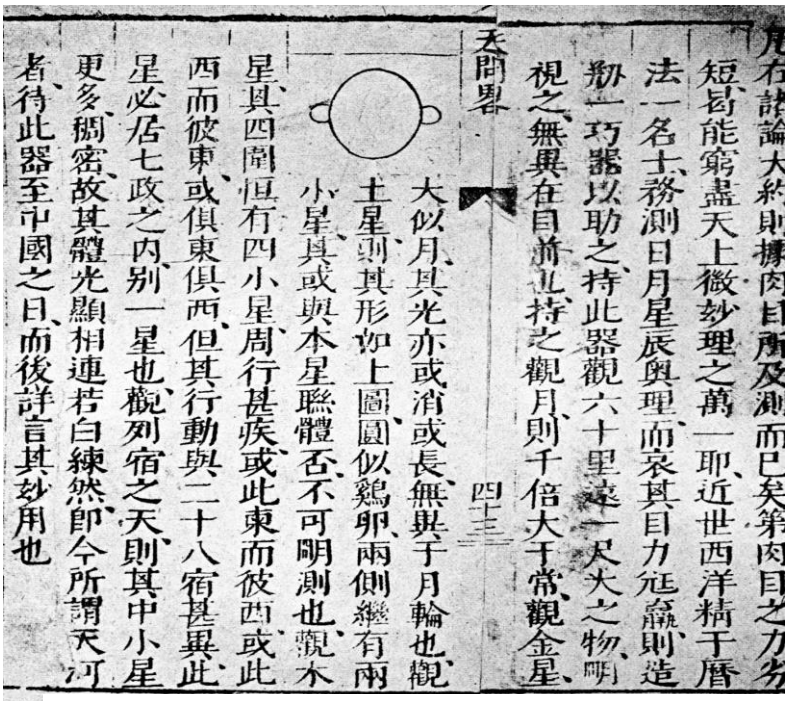

Figure 8. A Chinese brochure of 1615 advertising the Appendix written by Manuel Diaz describing Galileo's discoveries with a diagram showing Saturn's "handles." Owned by the author.

First, we have two pages of a pamphlet translated into Chinese by the Portuguese missionary Manuel Diaz. It mentions the telescope and tells us what new things can be seen with it; how close they appear because of magnification; the novelty of Jupiter's newly discovered satellites, as well as Saturn's odd appearance of having "handles."

[26] Among others, see Liam Brockey, *Journey East. The Jesuit Mission to China 1579-1724*. (Cambridge: Belknap Press of Harvard University, 2007), and Jacques Genet, 1985. *China and the Christian Impact. A Conflict of Cultures*. Translated by Janet Lloyd (New York: Cambridge University Press, 1985).

The second extraordinary transmission of cutting edge astronomical knowledge was the small treatise on making a telescope authored by the Chinese convert Wang Cheng (known as Dr. Philip). According to him:

> First place a lens that is made of glass which seems flat but in fact is not at the mouth of the tube. The lens is called mouth-piece, also called center-protruded lens [convex], or frontlens; next place a lens that is a bit curved-in [concave], also named eye-piece, center-recessed lens, or rear lens, at the back of the tube; if the proportion of the distance between the two lenses corresponds, one can see things.
>
> There are only two pieces of lens, but the number of tubes can be added as desired. One tube fits into the other, and the tubes can be shortened or lengthened. The tubes can be fastened with screws which allow free movement of the telescope up and down or left and right. Viewing is done using only one eye. An object of 60 *li* (miles) seems two hundred steps away. One can thus observe the moon, Venus, the sun, Jupiter, Saturn, and star constellations. When one observes the sun and Venus, one adds thereto a dark green lens. Alternately, place a piece of white paper under the telescope to observe the sun.[27]

In short, the missionary scientists wrote more than two dozen books on astronomy and the telescope, explaining all the major elements of the Western system, which both Chinese and European scholars knew was more accurate than Chinese astronomy. This was so because at least a half dozen empirical tests (using solar eclipses as markers) of the two systems were carried out by European scholars in China. All of them revealed the far greater accuracy of the *new* or *Western* system.

Furthermore, the missionaries who had strong scientific backgrounds brought a large part of Kepler's new optical theory to China and used it to explain why objects on the horizon may appear to be displaced from their actual positions. Some scholars have argued that the Jesuits held back critical astronomical information and that this affected the reception of European science.[28] However, the historical record shows something quite different: the

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[27] The passage quoted is from Fang Hao, *Studies in the History of the Relations between China and the West* (Peiping: Institutum Sancti Thomae, 1948), p. 293, who is quoting from Wang Cheng's book. This important discussion of Wang Cheng's work based on Father Fang Hao's research, published a year after D'Elia's original study, was added to D'Elia's account by the translators on p. 38 of *Galileo in China*. However, the translators mistranslated the key terms "*chung wa ching* "glass with sunken center" (or concave lens) and *chung gao ching "*glass with a protruded center" (or convex lens). The result was the reversal of the proper lens arrangement in a Dutch or Galilean telescope, that must place the convex lens as the objective and the concave as the eye-piece (ocular). The same mistake was made by Keizo Hashimoto, *Hsü Kuang-chi'i and Astronomical Reform*, p. 183, n58, who was probably following the translation in D'Elia. I am indebted to Chai Choon Lee for providing me with this revised and corrected translation of the Chinese text.

[28] This was originally argued by Nathan Sivin, especially in his essay, "Copernicus in China," *Studia Copernicana* 6 (1973): 63- 122. Joseph Needham himself gave more credit to the missionaries. More recently, and without providing any new or old evidence, Harriet Zurndorfer made the same claim of Jesuit

missionaries gave the Chinese scholars more than enough training and information to not only understand basic empirical and theoretical issues, but in fact to set about empirically testing major aspects of the assumptions of both Chinese and Ptolemaic astronomy. Xu Guangqi carried this out when he took over the Chinese Bureau of Mathematics and Astronomy in 1630. Xu chose a half dozen astronomical markers and compared the predictions of European and Chinese astronomers. All of the Chinese predictions were much less accurate than the European. That the Chinese scholars undertook this empirical testing of the two contrasting systems of astronomy was first pointed out in considerable detail by the Japanese scholar, Keizo Hashimoto, in 1988.[29] Clearly the significance of this research and testing is the fact that the Europeans gave the Chinese scholars all the information and training they needed to carry out their own research program testing the three systems (Chinese, Ptolemaic, and Tychonic). A great deal of the credit for this empirical success belongs to Xu Guangqi who designed the research strategy.[30]

At the same time, it evident that when European scholars, first Adam Schall von Bell and then Ferdinand Verbiest, took over the directorship of the *Chinese Bureau of Mathematics and Astronomy* (in the mid-1600s), both leaders trained dozens of Chinese scholars in the "new" or "Western" science of astronomy, so there were decades of European astronomical guidance when the new system could have been fully assimilated by Chinese scholars.

There are many fascinating details regarding the successes and failures, of rejection, arrest and imprisonment of the Jesuit scholars in China, but the point is that, despite all the efforts they made to give Chinese scholars all the intellectual tools needed, in the end, the project failed. Leading Chinese scholars clung to their old system of astronomy and astrology, and, perhaps most significant of all, when Ferdinand Verbiest wrote a memo to the Kangxi emperor (in the late 1670's)[31] urging the reform of the Chinese educational system to accommodate the new science, the Emperor refused permission to allow the printing of the memo. A prominent view among the Chinese scholars opposing the new system, was, "it is better to have no good astronomy than to have Westerners in China."[32] Furthermore, these nativist scholars thought, China had been a great civilization in the past when its astronomy was poor, so it is better to be a great civilization than to have good astronomy.

As a result, no reform of Chinese education was undertaken; in the succeeding centuries (from the seventeenth through the nineteenth), Chinese scholars made no significant

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stalling. See Harriet Zurndorfer, "China and Science on the Eve of the 'Great Divergence'1600-1800: A Review of Revisionist Scholarship in Western Languages." *History of Technology* 29 (2009): 81-101.

[29] Keizo Hashimoto, *Hsü Kuang-chi'i and Astronomical Reform. The Process of the Chinese Acceptance of Western Astronomy 1629-1635*. (Kansai, Japan: Kansai University Press,1988).

[30] For more on this see Hashimoto, *Astronomical Reform* and my *Intellectual Curiosity*, pp. 91-97. Also: see the list of Jesuit publication on astronomy in Appendix 2 in the third edition of *The Rise of Early Modern Science: Islam, China and the West* (Cambridge/ New York: Cambridge University Press, 2017).

[31] See Elman, *On Their Own Terms*, p. 145.

[32] George Wong, citing Yang Guangxian, in "China's Opposition to Western Science During Late Ming and Early China," *Isis*, 54 pt 1 (1963): 35.

contributions to the scientific revolution (or modern science) that had begun in Europe, the knowledge of which the missionaries attempted to bring to China.

Chinese Legal System

Finally, we must consider the Chinese legal system. Many scholars would argue that one legal system is functionally equivalent to another and should have no impact on scientific inquiry. The reality is, however, different.

Western legal scholars have pointed out that in virtually all European languages, the terms used to refer to the legal domain mean *law* as well as *rights* (*ius, diritto, droit, dercho, Recht*)[33]. In the Chinese legal codes, there are no such references, for traditional Chinese law was entirely a penal code.[34] The Chinese term that has been translated as "law," *fa*, means punishment, or at best a model of behavior that must be forcefully imposed on recalcitrant subjects.

Thus the Great Ming Code of the late fourteenth century (carried over to the Qing dynasty in the seventeenth century) begins with punishments, first spelling out the "Five Punishments" (beating with a light stick, beating with a heavy stick, penal servitude, exile, and the death penalty);[35] then come the "Ten Abominations" (such as rebellion, sedition, contumacy, depravity, irreverence and so on).[36] This group is followed by the "Eight Deliberations" that constitute a set of mitigating considerations that issue from Confucian notions of status hierarchy and filial piety. These are not existential or accidental circumstances that might mitigate punishment but are Confucian markers of status and kinship that grant privileged exemptions and sentence reduction. Conversely, for example, under these same principles, if someone violates the demands of filial piety (disrespect for elders or seniors) he could be charged with the crime of being "unfilial."[37] Put differently, this Confucianization of law meant that many offences to propriety had not been formally stated (had not in fact been "justicized"[38]) but yet could be the basis for criminal punishment, beating with bamboo and so on.[39] In other words, the Confucian idea of building the principles of sacred custom into the law, but without formally stating them,

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[33] Kenneth Pennington, "The History of Rights in Western Thought," *Emory Law Journal Review* 4 (1997): 237-252.

[34] McKnight, "From Statue to Precedent: An Introduction to Sung Law and Its Transformation," in *Law and the State in Traditional Asian Societies* (Honolulu: University of Hawaii Press, 1987), pp. 111-132

[35] The ancient five punishments were tattooing, cutting off the nose, cutting off the leg, castration, and capital punishment; T'ung-tsu Ch'ü, *Laws and Society* (Paris: Mouton, 1961), p. 364.

[36] *The Great Ming Code*, translated by Jiang Yonglin (Seattle: University of Washington Press, 2013), pp. 17-18.

[37] T'ung-tsu Ch'ü, *Law and Society*, chapter 6, section 3, "The Confucianization of the Law," especially 281ff.

[38] For this important process of transforming custom into justiciable law, see Paul Bohannan, "Law and Legal Institutions," *International Encyclopedia of the Social Sciences* 9 (1968): 73-8.

[39] Ch'ü, *Law and Society*, chapter 6.

meant that a whole realm of possible offenses ("an ocean" of legal possibilities[40]) were attached to the legal code. One could never be sure of what the law actually was.

As with the case of Islamic law, the idea of a formally trained and legitimate advocate (a defense attorney) was absent in Chinese law. In place of such a professional with a sworn oath to uphold the law, the Chinese system gave rise to the "litigation master,"[41] an informal legal specialist who worked behind the scenes, could not appear in public, and was often known to manipulate the parties in the case as well as to exaggerate the offenses to gain attention. If he were caught, the punishment could be very severe, leading to bambooing or transporting. Moreover, all of these quasi-legal actors were self-taught as there were no law schools.

Of course, it was the district magistrate (a legal novice) whose job it was to handle the vast majority of the cases starting at the village or town level. But there was no straightforward path for getting a formal hearing of a grievance, especially in cases where proper family conduct should have occurred but did not, and thus gave cause for litigation. After submission of a petition, the magistrate could (1) turn down the plaint without much reason; (2) turn it down because he thought the claims of the case were untrue; (3) recommend that the case be given back to the lineage elders for settlement; (4) give the case to a runner or middleman to settle; or (5) take the case himself. All these delaying strategies ended up generating still more petitions asking for legal intervention, thus clogging the courts.

These are just a few of the deficits in the Chinese legal system, standing in contrast to European theory and practice of the late medieval period. But here are several crucial points: first of all, there was no such thing as a legally autonomous entity in China: every domain was regulated by the Penal Code and the Emperor's edicts. No group of scholars could be considered legally autonomous, and no such scholars had the freedom to establish a new curriculum or course of study in an autonomous organization in the way that European universities were. Furthermore, if someone were trained in what the Chinese would call, "heterodox" beliefs, such a person would immediately fail the official examinations and be an outcast, if not seriously punished.

It was also true that possessing books on mathematics was illegal during certain periods of time, and stargazing outside the Emperor's closed circle was strictly forbidden. On the other hand, official stargazers were commanded to report to the Emperor what they saw every night in case heavenly omens suggested Royal misconduct or heavenly disfavor. Likewise, using a telescope was forbidden and one of the leaders of the Chinese Bureau or Astronomy and Mathematics (in 1631) was nearly imprisoned for using the telescope brought by the missionaries in 1619 before it was officially presented to the emperor.

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[40] This was the analogy used by the Japanese scholar, Shiga Shuzo, as cited in Huang, "Codified Law," p. 142.

[41] See Melissa Macauley, *Social Power and Legal Culture. Litigation Masters in Late Imperial China* (Stanford: Stanford University Press, 1998).

Here is a final striking illustration of how Royal edict controlled and inhibited scientific inquiry. It was standard practice in cases of suspected murder or foul play, that the magistrate, accompanied by a semiliterate coroner (not a physician), would go to the scene and examine the body. Since neither the magistrate nor the undertaker was trained in medicine, the magistrate used a manual — called *Washing Away of Wrongs* — in which were sketched the various so-called places of mortal wounds so that the investigation could be done "by the book." (See Figure 9).

This manual was first developed in the 12th century and it was used into the 19th century. It should be expected that people examining human bodies, in effect doing proto-autopsies after foul play, would discover various new anatomical structures. But the Royal edict declared that no changes to the manual could be made, and the scholars and officials involved declined to change the manual in any way, though they knew modification was needed.[42]

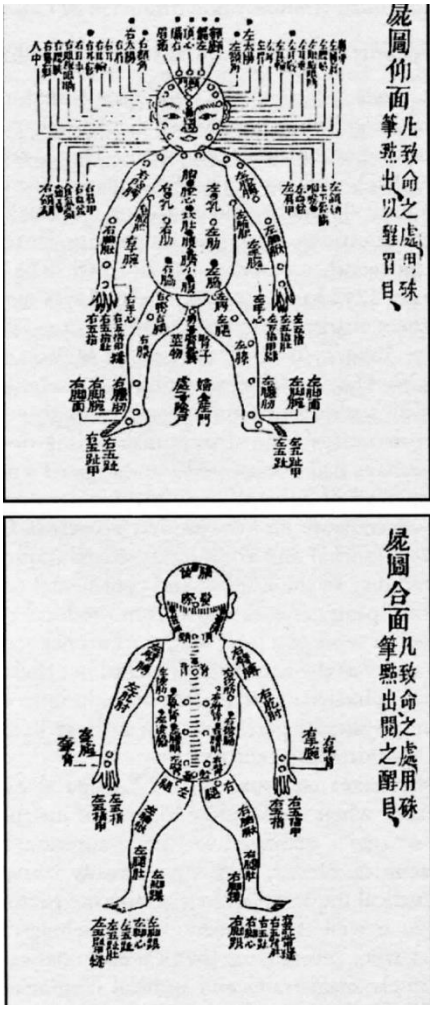

Figure 9. The dots in the figures indicate places of potentially mortal wounds while the circles indicate places of less severe injury. From an 1847 document, the "Washing Away of Wrongs."

Civilizational Analysis and the Great Divergence

Civilizational analysis when based on the plural conception of civilizations is neither a complete nor comprehensive mode of analysis. It can always be supplemented by the tools and techniques of the various social sciences. But for a certain range of phenomena and for certain periods of time, it is indispensable. It attempts to focus on the largest coherent units of analysis, civilizational configurations composed of 2+ n societies or peoples that transcend local constraints of time and space because of their underlying institutions and symbolic commitments.

Whatever the dynamics of these larger entities may be, and whatever commonalities they may have, the foregoing analysis has uncovered profound differences of development with universal consequences which surely extend into the twentieth century and beyond. They dramatize the importance of this kind of

[42] Pierre-Étienne Will, "Developing Forensic Knowledge Through Cases in the Qing Dynasty," in *Thinking with Cases*, edited by Charlotte Furth, Judith T. Zeitlin and Ping-chen Hsiung (Honolulu: University of Hawaii Pres, 2007), pp. 62-100.

analysis. They suggest that these earlier historical developments of a civilization-wide nature make a difference in world historical outcomes. Only by adopting such a framework can one understand the uniqueness of Western development as well as the singularity of the emergence of modern science, due process of law, parliamentary democracy, and other unique legal and institutional devices that made long term economic development possible. In Max Weber's terms, the European transformation had *universal* implications for the global order.

There are, for example, a number of crucial cultural and institutional differences between the three civilizations of Europe, China, and the Islamic world. I have suggested that from a civilizational point of view, indigenous legal systems serve as indispensable identifying characteristics of the three civilizations. This was so because legal systems are institutional arrangements that are meant to regulate all aspects of social and cultural behavior within the jurisdiction of the cultural system during the formative period of civilizational gestation. Once a legal system is put in place, it tends to remain as a crucial reference point for all future action. Depending upon how elaborately the legal scholars worked out the fine details of the legal universe, it has the potential to envelop the entire gamut of social and cultural behavior within a civilization, and to do so in perpetuity. This is because only highly developed legal systems have worked out processes and procedures for formalized legal change (i.e., legislation). Neither the Islamic nor the Chinese system evolved to the point of this legislative change option.[43] Furthermore, even after upheavals and "revolutions," the elites within particular civilizations often revert to the rudiments of the previous legal regime. One may also note that this same kind of analysis could be applied to India and Russia as civilizational entities.

In reality, legal systems are *alternative* moral and intellectual geometries: they codify and divide up the moral terrain in sharply contrasting ways. When looked at comparatively, a large number of differences stand out, in effect creating contrasting limits and possibilities of legal action, commerce, ownership, and much more. Additionally, not all legal systems are equal, not all of them worked out the same (if any) conceptions of human rights, due process, legal autonomy, and so on. Even when there are direct encounters between representatives of contrasting civilizations, their fundamental legal and religious structures often remain intact. Consequently, those codified differences have had profound consequences for scientific, political and economic development. Max Weber had intuited much of this during his early work in European legal history, but his death at the age 56 meant that his most seminal work, his essays in the *Sociology of Law*, along with his superb cross-civilizational studies, remained a set of tentative reflections.

What is certain is that the three civilizations discussed herein did develop in entirely different ways, creating what authors in other contexts have called "a great divergence". But that divergence was not confined to nor did it originate in the eighteen or nineteenth

[43] More details on this will be found in the third edition of *The Rise of Early Modern Science: Islam, China and the West* by Anthony Huff (Cambridge: Cambridge University Press, forthcoming April 2017).

centuries as the conception was originally formulated,[44] but far earlier in a defining "axial age" of the European middle ages.

A brief summation of the great divergence seen through this lens, and despite the three intercivilizational encounters, can be put as follows.

At all times, it is indispensable to maintain a *comparative* framework. I began these inquiries with the question of scientific development, why modern science developed in the western world but not Islam or China. Only much later did I fully explore the singular importance of juridical ideas on social and cultural development. Nor did I at any time exclude the importance of religious and philosophical ideas or economic factors.

Some people have imagined that modern science could have arisen anywhere, but the fact is, it did not. As we saw in the three encounters between Europe, China, and Islam, the cultural elite took the contrasting civilizations in very different directions.

Between the ninth and tenth centuries, the first encounter between Greek and Roman-inspired Western civilization and the emerging Islamic civilization resulted in the transfer to Islamic civilization of a wealth of intellectual resources, especially Greek natural philosophy. During the early phase of this transmission, there were outstanding Arab scholars who took the assimilation of this new material seriously.

But the religious scholars (the ulama) undertook to create a new educational institution dedicated entirely to the religious sciences; therefore the study of the ancient or foreign sciences was given over to private scholars who could not discuss this material in the *madrasas*. The early Arab masters of Greek natural philosophy made some significant advances in medicine, optics, astronomy and mathematics, but these petered out in many fields by the end of the twelfth century. One could nevertheless suggest that at least the theoretical modelling aspect of Islamic astronomy continued to the end of the fourteenth century with the work of Ibn al-Shatir, (d. 1375), but no revolutionary breakthrough or advances in theoretical or observational astronomy occurred. When the telescope arrived in the Muslim world as early as the 1620s, no Muslim scholars or astronomers were interested in its use for astronomical or scientific purposes. In its most important scientific field, optics, Europeans had begun to supersede Arab scholars both practically and theoretically by the fourteenth century. Despite Ibn al-Haytham's genius in the study of light, no one in the Muslim world invented the lens or eyeglasses. In astronomy, Muslims

[44] Kenneth Pomeranz, *The Great Divergence: China, Europe, and the Making of the Modern Economy* (Princeton: Princeton University Press, 2000). Since then an astonishing amount has been written on this subject by economists and others. For a very recent summation of all this work, see Peer Vries, *State, Economy and the Great Divergence. Great Britain and China 1680s-1850s* (London: Bloomsbury, 2015); and idem, "What we do and do not know about the Great Divergence at the beginning of 2016." https://www.researchgate.net/publication/290920219_What_we_do_and_do_not_know_about_the_Great_Divergence_at_the_beginning_of_2016.

hung onto the ancient earth-centered worldview even through the eighteen and nineteenth centuries.

In the realm of law, the early Muslims had no use for the Roman Civil law which had been in use for centuries across the formerly Christian Middle East. Islamic legal scholars went in an entirely different direction based on the revealed word of the Quran. Consequently, they did not develop a clear sense of due process of law, and did not reform their legal system until forced to by trade with Europeans in the eighteenth and nineteenth centuries. They found no Quranic basis for articulating the idea of human rights, the beginnings of which were found among Christian legal scholars in the twelfth and thirteenth centuries.[45]

In the case of China, as late as the end of the seventeenth century, the Chinese rejected the Western scientific worldview made available to them with great effort by the Christian missionaries. Consequently, fully qualified Chinese scholars were prevented from making any contributions to the rise of modern science.

In the domain of law, there was another dominating impediment to the development of constitutionalism, parliamentary democracy, and due process of law. The whole legal domain remained within the sphere of the Emperor's wish, and no body of independent scholars, no law schools, were allowed to emerge.[46] The progressive legal development so characteristic of European history was absent. These legal rigidities likewise ensured the continuation of the backward-looking education regime centered on the ancient Chinese classics, without any focus on natural science, all the way to the twentieth century.

Given these profound differences of civilizational architecture and progression, one would think that social scientists would acknowledge the likelihood that supposedly universal sociological and economic principles and processes have natural limits within civilizational boundaries. A great deal of social scientific thinking presupposes universal application (because results in the US, for example, were often replicated in European societies), but fails to admit such results were achievable because of the underlying *civilizational foundations* that had been put in place centuries earlier.

Economists in particular have often been purveyors of this perspective because of their assumption that "economic man" is always the chief actor. This has been conjoined with their assumption that economic man can simply tweak the underlying cultural resources to arrive at the legal equivalents to the Western conceptions that were a long time in

[45] Brian Tierney, *The Idea of Natural Rights*: *Studies on Natural Rights, Natural Law, and Church Law, 1150-1625* (Grand Rapids, Michigan: William B. Eerdmans,1997); and Kenneth Pennington, "The History of Rights in Western Though," *Emory Law Journal Review* 4 (1997): 237-252.

[46] A remarkable contemporary parallel to the prohibition against the autonomy of social groups in contemporary China was recently pointed out by James Fallows, "Throughout the Communist era, the Chinese state has suppressed the growth of any form of organization other than the party itself." "China's Great Leap Backward," *The Atlantic*, November 15, 2016.

gestation.[47] Much more research in a civilizational mode of analysis on these questions, among many others, is needed.

In short, the study of civilizations and civilizational configurations of the past reveal quite different paths of development suggesting that "path dependence" also applies to comparative civilizational history. I hope to extend this analysis further in future essays.

[47] There are scores of writings about this assumption in the literature, a good recent example of which, building upon such typical assumptions, is Daron Acemoglu and James A. Robinson, *Why Nations Fail: The Origins of Power, Prosperity, and Poverty* (London: Profile Books, 2012). My review in *Contemporary Sociology* 42 1(2013): 55-59.